



APPENDIX C – INSPECTION CHECKLIST

Prior to Start of Field Work:

1. Remind the Contractor of his responsibility to submit shop plans, calculation sheets, and notice of material sources in a timely manner.
2. Review of shop drawings: The Structure Representative has an active role in the review of prestress shop drawings. The *Bridge Memo to Designers*, Section 11-1 *Precast and/or Prestressed*, defines the roles and responsibilities for shop drawing review. Although the majority of the prestress shop drawing review responsibilities fall on the Designer, the Structure Representative should review all aspects of the shop drawings to fully understand the prestressing system to be constructed. In addition, the Structure Representative should be in contact with the Designer throughout the entire review and approval process.
 - a. Check tendon paths and the Contractor's corresponding calculations. Calculate ordinates at enough points to produce a smooth path.
 - b. Compare physical layout of end anchorage details on shop plans with details shown on contract plans and B8-5 of the Standard Plans.
 - c. Rough-check length of tendons or bars as calculated by Contractor.
 - d. Review stressing sequence and locations of stressing operation shown on shop drawings.
 - e. If block-outs extend beyond the face of abutment, additional steel may be required. Also, special attention should be given to the support of the block-out concrete.
 - f. Check for possible conflicts with ducts at columns, caps, abutments, and hinges, due to reinforcing steel, hinge restrainers, utilities, and deck drains.
 - g. Check to see if additional rebar, or changes in concrete dimensions, will be required to accommodate the Contractor's system. Such details should be included on the shop plans.
 - h. Skewed structures require additional investigation.
 - i. Check elongation calculations.
 - j. Concur with Structure Design on shop drawings.
 - k. Contractor should provide V.P.I. powder information.
 - l. Check grouting plan. Plan must include the information required by Section 50-1.101C(3):
 - 1) Detailed grouting sequence.
 - 2) Type.
 - 3) Quality and brand of materials to be used.
 - 4) Type of equipment to be used including provisions for backup equipment.
 - 5) Types and location for grout inlets.
 - 6) Outlets and vents.
 - 7) Methods to clean ducts before grouting.
 - 8) Methods to control the rate of flow within the ducts.
 - 9) Theoretical grout volume calculations for each duct.
 - 10) Duct repair procedures due to an air pressure test failure.



- 11) Mixing and pumping procedures.
 - 12) Direction of grouting.
 - 13) Sequence of use of inlets and outlets.
 - 14) Procedure for secondary grouting.
 - 15) Names of people who will perform grouting activities including their relevant experience and certifications.
3. Shop drawings should be reviewed thoroughly, but also as quickly as possible. In most cases *Standard Specifications*⁴⁹ mandate a 60 day review time for railroad bridges and 45 days for other structures. Be sure to check the *Special Provisions* for your contract, and remind those involved in the review process of the time requirements.
 4. Make sure everyone concerned (Structures Design, Structure Representative, Contractor, subcontractor) are working from the authorized shop drawings.

When Prestressing Materials Arrive at Jobsite:

1. See that material has been released and physically identified by METS TL-0624, *Inspection Release Tag*. (Record the area (A) and Young's Modulus (E) of the strand from both the orange tags, and the fabricator's tags for each individual strand pack.) Collect the orange release tag to coincide with the TL-29. Do not remove all of the release tags.
2. Check condition of packs.
3. Scan material to see that it is what contract and shop drawings call for by number, size, length, etc.
4. Determine if required rust inhibitor agent (VPI, etc.) has been applied to prestressing steel – check for rust.
5. Check condition of ducts thoroughly.
6. Check storage site for adequate protection of materials.

Bearing Plates and Trumpets:

1. Check that block-outs are formed to correct slope/batter. Use alignment tool to check if bearing plates are perpendicular to the ducts.
2. Make certain anchor plates are the correct size.
3. Check that the trumpets are properly secured to the bearing plates.

Placement of Rigid Ducts:

1. Check the adequacy of end anchorage formwork. Check the size of anchorage hardware. Plates should be fastened to the forms at the proper angle, grout tight, and secured.
2. Make sure each girder contains the correct number of ducts and the same size as called for on the shop drawings.

⁴⁹ 2010 SS, Section 50-1.01C(3) *Shop Drawings*.



3. Check joints for adequate grade of waterproof tape. Be sure that there are adequate ties to hold ducts from floating during placement of PCC. Stagger joints to maintain proper profile.
4. Check final profile of rigid duct. Consider camber in forms when visually inspecting the tendon drape. The first 15 feet (4.6 m) from the end anchorage should also be given special attention to eliminate severe angular changes. Correction may be required due to superelevation. Use duct check apparatus if required.
5. Check installation of intermediate grout vents⁵⁰.
6. Check that snap ties, tie bolts, etc., have not been placed through or just above or below ducts. Movement of ducts during stem pour can crush duct. Pass bullet through ducts to check for obstructions.
7. Make sure that all defects in ducts (breaks, crushed areas, etc.) have been repaired prior to concrete pour. Crushed ducts have caused problems in pulling strands and grouting.
8. Check reinforcing details. #4's (#13) at 12" (305 mm) O.C. at block-outs, 2-1/2" (60 mm) clearance for stirrups, 1'-6" (450 mm) behind bearing plates, duct ties, etc. Also consider any additional details shown on the shop drawings.
9. Seal tendon openings to prevent water or debris from entering the duct.

During Stem Pour:

1. If possible, cover ducts with an inch of concrete in bent cap area but allow for cap rebar clearance.
2. Avoid rock pockets by proper vibration of concrete, particularly around anchor plates and low areas of the duct's path.
3. Avoid impact dumping on ducts and dropping vibrator directly on the ducts.
4. Check alignment to see that no unusual movement takes place during pour.

After Stem Pour:

1. Ducts must be checked to see if they are free of obstructions and clear of water and debris. The ends of the ducts must be re-covered after the ducts are checked.
2. Repair damaged ducts.
3. Check if ducts are in line with trumpets.

During Deck Pour:

1. See that vent pipes are not damaged during pour.
2. Sketch or mark location of vents.
3. Be sure sufficient concrete test cylinders are taken.

⁵⁰ 07-19-2013 RSS, Section 50-1.03B(2)(d)(xi), *Vents*.

**Fabrication and Placement of Tendons:**

1. There should be an adequate area to pull the strands. The strands should be protected from contamination during fabrication. Pushing the strand is common practice that provides better protection for the strand.
2. When a complete tendon is fabricated on the ground, the strands must be cleaned of dirt and debris before pulling the tendon through the duct. Strands must also be protected from scraping or wear when pulled over dunnage.
3. Contractor must demonstrate that the ducts are free of water and debris. If water is encountered in the ducts, have the water removed.
4. Inspect the strands for rust.
5. Avoid unusual angle points when pulling the tendons into the ducts. Make use of rollers or pulleys.
6. Make sure tendons are installed in their proper locations.
7. Consider “rust free” period and possible need for corrosion inhibitor.

Prior to the Stressing Operation:

1. See that the Contractor has furnished the required calibration curves for specific jack/gage combinations. Make sure that this is listed on METS’ authorized jack calibration list.⁵¹
2. Check out pressure cell. The battery should be charged for 8 hrs maximum prior to usage. While using the pressure cell in the field, only turn it on while monitoring the Contractor’s jack.
3. Get familiar with all the prestressing procedures, potential problems with the particular system being used, shop plans, and elongation calculations.
4. Set up prestressing tables to document a complete record of each tendon stressed. Have elongation calculated beforehand, using the material properties provided by the fabricator for the individual strand packs.
5. Check to see if the stressing is from one end, from both ends, or simultaneously from both ends.
6. Make sure you have discussed the stressing sequence with the Contractor.
7. Inspect the area around the anchorages for rock pockets. Large voids should be re-poured, while small voids should be dry-packed. Epoxy concrete or other specialty concrete mixes should not be used for repairs, whether before or after stressing.
8. Inspect the deck surface for excessive cracking, and repair areas not in compliance with the specifications.

During the Stressing Operation:

1. Direct the Contractor to paint strands on both ends and check for slippage.
2. Plot at least one calibration curve per structure.

⁵¹ http://www.dot.ca.gov/hq/esc/approved_products_list/pdf/ps-pt_jack_calibration.pdf



3. If elongation falls outside the acceptable limits, find out why.
4. If any anchorage hardware fails (even if the problem was corrected), call the area senior and the SC HQ office.⁵²
5. It is the practice of Structure Construction to monitor the Contractor's jacks at the start of each day, but not necessarily while stressing every tendon. The Structure Representative may require additional monitoring, which overrides SC practice.
6. If a strand breaks during the stressing operation, the Designer and the Post-tensioned Concrete Technical Committee should be contacted. Two or more strands breaking in the same tendon may indicate a problem at a particular location in the duct. This situation must be thoroughly reviewed and discussed with Structure Design and METS before additional work on the girder can be completed.

Grouting Operation:

1. Check for missing strands before placing grout caps.
2. Witness pressure testing for the ducts as required by the *Standard Specifications*.⁵³
3. Make sure the grouting equipment meets specifications and has adequate capacity for the job.
4. Make sure the cement is the correct type and protected from adverse conditions. The cement must be supplied by an authorized source and a Certificate of Compliance is required prior to placing the grout.
5. Use water/cement ratio not to exceed 5 gallons of water to one sack of cement.
6. Check the authorized admixture list on the SC website under "Field Resources" to verify that proposed admixtures are acceptable. Contact METS for additional information on admixtures.
7. Check efflux time in accordance with test method.
8. Make sure there is continuous agitation of grout during grouting.
9. Monitor the grouting pressure. Pressure should gradually increase as the duct is filled. A sudden jump in pressure usually indicates blockage.
10. Close outlet valve before closing inlet valve.
11. Verify the Contractor is collecting the data needed for the required daily grouting report to be submitted within 3 days of grouting per the *Standard Specifications*.⁵⁴

Miscellaneous:

Most of the preceding inspection suggestions are also applicable to post-tensioned tie-backs, transverse deck stressing, and tie-down systems. However, there are a number of additional inspection items that are unique to these non box-girder applications. Inspection suggestions can be coordinated through the SC HQ in Sacramento.

⁵² (916) 227-7777.

⁵³ 2010 SS, Section 50-1.01D(4), *Pressure Testing Ducts*.

⁵⁴ 2010 SS, Section 50-1.01C(5), *Duct Demonstration of Post-Tensioned Members*.



Early or partial post-tensioning of a structure due to project related issues such as a potential loss of falsework due to flooding must be considered on a job specific basis. In most cases, decisions must be made quickly, so it is important for both the Designer and Structure Representative to work as fast as possible toward a solution.